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Costs and Benefits of Cleaning U.S. Wheat Overview and Implications

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Abstract

Cleaning all U.S. wheat for export above the current level is not economically feasible because costs of additional cleaning at the lowest net-cost location--country elevators for spring wheat and subterminal elevators for winter wheat--would outweigh benefits by at least \$8 million in the short run. Since it is not in the U.S. wheat industry's interest to clean all export wheat, an alternative would be to target clean wheat for special niche markets. The wheat industry could potentially gain \$8 to \$10 million in net benefits if it targets wheat cleaning to the cleanliness-conscious markets, which account for about 20 percent of all U.S. wheat exports. Any public policy designed to promote cleanliness of U.S. wheat exports and to improve U.S. competitiveness in the world market must address the issue of how much, where, and which classes of wheat to clean and target for cleanliness-conscious markets. Policy options worthy of consideration include establishing dockage as a grade-determining factor, segregating wheat by its intrinsic characteristics, and launching an information (outreach) program to meet buyer preferences and to familiarize foreign buyers with U.S. wheat quality.

Keywords: Wheat cleaning, wheat quality, costs of cleaning, elevators, benefits of cleaning, dockage, targeted cleaning, policy options

Foreword

In recent years, there have been increasing concerns over the quality of grains exported from the United States versus the quality of competitors' grain. Some observers believe that selling grain that contains higher levels of shrunken and broken kernels, dockage, and foreign material than that of our competitors has reduced U.S. competitiveness in the world grain market. Advocates argue that improving the cleanliness of U.S. grain will increase market share or is necessary to maintain U.S. market share at current levels. On the other hand, critics argue that improving the overall cleanliness of U.S. grain will increase marketing costs, reduce profits, and diminish U.S. competitiveness.

Congress recognized that the information currently available was insufficient to support either claim. Therefore, the Food, Agriculture, Conservation, and Trade Act of 1990 mandated the Federal Grain Inspection Service (FGIS) to determine the costs and benefits associated with cleaning U.S. grain. Title XX of the act, entitled "Grain Quality Incentives Act of 1990," called for a comprehensive commodity-by-commodity study of economic costs and benefits of cleaning grain. In response, FGIS signed a cooperative research agreement with ERS in September 1990 to conduct an economic study of the costs and benefits of cleaning U.S. grains. The agreement specified that the project cover five commodities: wheat, corn, soybeans, sorghum, and barley.

This report presents an overview and implications of the study results for wheat. In addition, ERS's wheat study produced two other reports. The first, *Economic Implications of Cleaning Wheat in the United States*, focuses on the costs and domestic benefits of cleaning wheat. The second, *The Role of Quality in Wheat Import Decisionmaking*, focuses on importers' preferences with respect to cleanliness and other quality factors, and assesses the benefits of selling cleaner wheat in international markets. The first report is based primarily on special studies conducted by contractors representing trade associations and State Agricultural Experiment Stations. The second report is based primarily on interviews with foreign buyers in 18 wheat importing countries. Reports for other commodities (corn, soybeans, sorghum, and barley) will be released in 1994.

ERS received valuable input and advice from a Steering Committee, representing many industry associations and commodity organizations. The authors of reports prepared under research agreements with ERS also made important contributions. As with all ERS studies, however, the content of this report is the sole responsibility of ERS.

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Costs and Benefits of Cleaning U.S. Grain

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Project Title: Evaluation of
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Import Demands.

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Summary

Cleaning all U.S. export wheat beyond current practice is not economically feasible. Costs of additional cleaning would outweigh benefits by at least \$8 million per year in the short run. The best strategy for promoting cleanliness of U.S. export wheat is to target clean wheat for niche markets, those that use wheat to meet very specific end-use demands for high-quality food products.

Concern over the quality of grain exported from the United States versus the quality of competitors' grain has increased in recent years. Some observers believe that selling grain that contains higher levels of dockage and foreign material than that of our competitors has reduced U.S. competitiveness in the world grain market. (Dockage is all matter other than wheat, such as chaff, stems, and stones. Foreign material is all matter other than wheat after dockage is removed; it is the most difficult material to remove from wheat.) Advocates argue that improving the cleanliness of U.S. grain will increase market share or is necessary to maintain U.S. market share at current levels. Critics argue that improving cleanliness will increase marketing costs, reduce profits, and diminish U.S. competitiveness.

In response to a request from Congress, the Economic Research Service (ERS), in cooperation with researchers at land-grant universities and the U.S. grain industry, conducted a study on the costs and benefits of cleaning U.S. grain. *Costs and Benefits of Cleaning U.S. Wheat* presents an overview and implications of this study and summarizes two other ERS reports produced in response to this study. The first, *Economic Implications of Cleaning Wheat in the United States*, focuses on the costs and domestic benefits of cleaning wheat. The second, *The Role of Quality in Wheat Import Decisionmaking*, focuses on importers' preferences with respect to cleanliness and other quality factors, and assesses the benefits of cleaning export wheat for international markets.

The wheat industry could gain \$8 to \$10 million in net benefits if it targets wheat cleaning to the cleanliness-conscious markets, which account for about 20 percent of all U.S. wheat exports. These markets include Italy, Venezuela, Togo, Ghana, and possibly Japan and the Philippines. The United States competes with Canada and Australia for these markets. Targeted wheat classes for cleaning are primarily dark northern spring (DNS) and durum wheat exported from the Pacific and Gulf ports.

While selling cleaner U.S. wheat in cleanliness-conscious markets may increase export prices or enhance the U.S. competitive position, cleanliness is not the most important factor affecting importers' demand for wheat. Price considerations, cleanliness, quality considerations, and institutional factors all influence the selection of a supply source in the world wheat market. In the many low-income countries that account for a majority of world wheat imports, wheat price, not quality, is the most important factor in the purchase decision.

Institutional factors that influence importers' purchase decisions include: (1) the structure of the importers' purchasing organization, (2) the U.S. competitive selling system versus the single-desk selling agencies of Canada and Australia, and (3) challenges facing the United States because of U.S. reliance on contract specification as a tool to meet buyers' quality needs. Measures to address these institutional issues include a "clean wheat" contract specification option for foreign buyers, continuing programs to improve quality determination, and establishing quality as a criterion under the Export Enhancement Program.

Cleanliness and quality in general may play a more important role in foreign buyers' purchase decisions in the future. Relaxing state control over grain trading in several countries that are currently contemplating such an action, including China, Russia, Taiwan, Ghana, Morocco, and Tunisia, would increase the impact of selectively offering cleaner wheat. Quality could become more of a determining factor in the wheat trade if per capita income continues to grow in low to medium income importing countries and in quality-conscious markets. A General Agreement on Tariffs and Trade agreement reducing the use of export subsidies could also potentially reduce the importance of price and elevate quality in purchasing decisions of importers. Cleanliness and quality will become more important as a result of increasing concerns about food safety and broader use of specific contracts which reflect increasing sophistication in milling and baking technology.

Cleaning wheat has potential benefits in both domestic and international markets. Domestic benefits occur in the form of lower handling, storage, and transportation costs, and revenues from sales of screenings. Domestic benefits from cleaning are greater at country elevators than at subterminal or export elevators because of larger savings in transportation costs and greater revenues from screenings sales. International benefits stem from any premiums foreign buyers are willing to pay for cleaner wheat and from increases in U.S. wheat exports. The least net-cost location for cleaning is country elevators for spring wheat and subterminal elevators for winter wheat.

Public policy designed to promote cleanliness of U.S. wheat exports and to improve U.S. competitiveness on the world market must address the issue of how much, where, and which classes of wheat to clean and target for cleanliness-conscious markets. Policy options worth considering include establishing dockage as a grade-determining factor, and launching an information program to meet buyer preferences and to familiarize foreign buyers with U.S. wheat quality. An information program, together with a quality preservation program to segregate U.S. wheat by intrinsic characteristics, can also be implemented to enhance overall U.S. quality competitiveness in the world market. All policy options must be critically evaluated in terms of their costs and benefits before being presented for final decisionmaking.

Costs and Benefits of Cleaning U.S. Wheat

Overview and Implications

William Lin
Mack Leath

Introduction

In recent years, concern over the quality of grain exported from the United States versus the quality of competitors' grain has risen. The issue of the quality of U.S. grain was raised during debate on the Food Security Act of 1985. To gain more information, Congress amended the act and directed the Office of Technology Assessment (OTA) to conduct a comprehensive study of the technologies, institutions, and policies that affect U.S. grain quality and to prepare a comparative analysis of the grain systems of major export competitors of the United States.¹

The OTA study did not end the debate over grain quality, partly because the study did not provide the costs and benefits of cleaning U.S. grain. Some observers believe that selling grain that contains higher levels of dockage and foreign material than that of our competitors has reduced U.S. competitiveness in the world grain market. Advocates of tighter U.S. grain standards related to cleanliness argue that improving grain cleanliness will either increase U.S. market share in the world market or is necessary to maintain U.S. market share at current levels. On the other hand, many traders and handlers argue that tighter standards regarding grain cleanliness will increase marketing costs, reduce profits, and diminish U.S. competitiveness.

In the 1990 farm bill debate, Congress recognized that the information available at that time was insufficient to support either claim. Therefore, Congress included a Grain Quality Title (XX) in the Food, Agriculture, Conservation, and Trade Act (FACTA) of 1990 entitled

"Grain Quality Incentives Act of 1990." The Grain Quality Title requires the U.S. Department of Agriculture's (USDA) Federal Grain Inspection Service (FGIS) to establish or amend grain grades and standards to include "economically and commercially practical levels of cleanliness" for grain meeting the requirements of grade U.S. No. 3 or better. Before implementing tighter "cleanliness" standards, however, USDA is required to conduct a comprehensive commodity-by-commodity study of technical constraints and economic costs and benefits associated with any such changes. Studies were mandated for wheat, corn, soybeans, sorghum, and barley.

In response to this mandate, FGIS entered into a reimbursable research agreement with USDA's Economic Research Service (ERS) to conduct the economic study. This report provides an overview of the costs and benefits of cleaning U.S. wheat and presents implications and policy options to enhance U.S. wheat cleanliness and quality competitiveness in the world market.²

¹The results of this study were published in three reports: (1) *Enhancing the Quality of U.S. Grain for International Trade*, OTA-F-399; (2) *Enhancing the Quality of U.S. Grain for International Trade: Summary*, OTA-F-400; and (3) *Grain Quality in International Trade: A Comparison of Major U.S. Competitors*, OTA-F-402 (U.S. Government Printing Office, Feb. 1989).

²For a more detailed analysis on the costs and domestic benefits of cleaning wheat see *Economic Implications of Cleaning Wheat in the United States* (AER-669). Similarly, for a more detailed analysis on importers' preferences with respect to cleanliness and other quality factors and international benefits of selling cleaner U.S. wheat see *The Role of Quality in Wheat Import Decisionmaking* (AER-670).

What Are the Issues Being Debated?

The issues of wheat cleanliness being debated include:

- Members of U.S. Congress, grain handlers, exporters, and producers are concerned that the United States is suffering from reduced export volumes, loss of market shares, and/or price discounts. These losses could be due to a higher level of dockage in U.S. wheat exports, and other differences, compared with wheat exported by major competitors.
- The U.S. grain industry is concerned that cleaning wheat across the board could force producers or elevators to incur higher costs. These higher costs might not be recovered in the marketplace and could put the U.S. grain industry at a competitive disadvantage.
- Even if selling cleaner U.S. wheat results in premiums or expanded U.S. wheat sales in some importing countries, will the benefits from cleaning outweigh the costs?
- Is there an optimal volume of cleaning that would permit U.S. traders to respond better to cleanliness-sensitive markets, but not price U.S. wheat out of price-sensitive ones? Are there niche markets for clean wheat that can be targeted? Are there classes of wheat or ports of export that would generate net benefits from additional cleaning?

Defining Cleanliness in Wheat Quality

Wheat cleanliness, for the purposes of this study, refers to the measured level of dockage and foreign material (FM) found in wheat. Dockage is the nonmillable material (such as weed seed, chaff, stems, and stones) that can be readily removed through mechanical cleaning because its weight or size differs from wheat kernels. Foreign material is nonmillable material that is more difficult to remove with screens or aspirators because its weight, size, and shape is similar to wheat kernels.

Quality of wheat, which is a much broader concept than cleanliness, is defined differently for each end-use of the grain, and the ultimate test of wheat quality lies in its performance (that is, milling and baking characteristics related to producing final products). Measuring the characteristics of wheat quality requires an assessment of attributes that concern buyers. These quality attributes describe the physical properties or the intrinsic characteristics that may affect the storage and/or processing of the grain, as well as quality of final products.

Wheat quality has three dimensions: (1) physical condition, including purity and soundness, (2) intrinsic characteristics, and (3) uniformity (fig. 1). Purity and soundness relate to the wheat's physical properties. Purity is an indicator of grain cleanliness and wholesomeness, while soundness reflects the extent of defects in the grain. Intrinsic attributes are the biochemical and structural properties inherent in the grain. Uniformity measures the variation of grain quality, either physical or intrinsic. Soundness, purity, and intrinsic characteristics of wheat all affect its performance in terms of its storability and/or processing and end-use properties.

The official U.S. Grades and Standards for wheat focus primarily on physical characteristics and do not address most of the intrinsic attributes. The Grades and Standards address cleanliness through the inclusion of FM as a grade-determining factor. Dockage is removed in the inspection process before other grade-determining factors are measured. The dockage present in a sample is always measured and recorded on inspection certificates even though it is not a grade-determining factor.

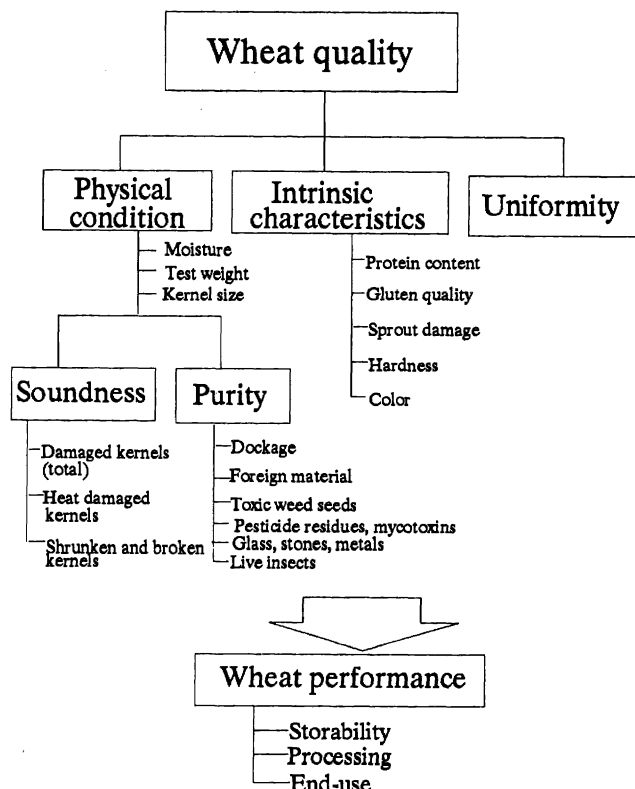
Wheat Cleanliness in the United States

Wheat cleanliness improves as wheat moves through the marketing system toward export terminals. For example, during 1989-91, the dockage in hard red winter (HRW) wheat declined from an average of 1.2 percent at harvest to 0.6-0.7 percent at export terminals, and FM declined from 0.9 percent at harvest to 0.2-0.3 percent at port terminals.³ This pattern of change in cleanliness also applied to other classes of wheat.

³The 0.6-0.7 percent dockage and 0.2-0.3 percent FM levels are based on FGIS inspections for 1989-91 reported in *1991 U.S. Grain Exports: Quality Report*, April 1992. Exporters participating in the elevator survey conducted by the National Grain and Feed Association reported an average dockage content of 0.5 percent and FM of 0.4 percent.

Figure 1

Wheat quality dimensions that affect end-use performance



Source: Adapted from the National Wheat Improvement Committee.

Wheat destined for export markets is generally cleaner than wheat received by domestic flour mills. The dockage of HRW wheat delivered to flour mills averages 0.2-0.3 percentage points higher than wheat cargos destined for foreign markets that are inspected by the FGIS at U.S. ports.

Flour millers always remove the nonmillable material (including dockage, FM, and shrunken and broken kernels) to the greatest extent possible. The cost of cleaning wheat remains virtually unchanged regardless of the amount of FM and dockage removed. Hence, there is little incentive for flour millers to offer premiums to elevators for cleaner wheat.⁴ Two-thirds or more of domestic flour millers do not specify dockage limits in their purchase contracts. However, they deduct dockage from the gross weight of wheat shipments.

Wheat cleaning for domestic use occurs at flour mills for the most part, and dockage in HRW wheat is reduced from an average of 0.9 percent upon arrival to 0.03 percent at first break, prior to milling. This same pattern of change in dockage content applies to other major classes of wheat. Wheat delivered to export elevators is much cleaner than wheat received by country elevators due to aggregating and cleaning while moving through

the system. The dockage content of HRW wheat received by country elevators averages 1.0 percent, which is higher than that of wheat received at terminal or export elevators. The dockage content of hard red spring (HRS) wheat declines from an average of 1.8 percent at country elevators to an average of 0.9 percent at ports.

Costs of Cleaning U.S. Wheat

This study measures the costs of cleaning U.S. wheat. Two estimates of total cleaning costs were determined: (1) cleaning all U.S. export wheat, and (2) cleaning all U.S. nonfeed wheat. Estimated total costs of cleaning all U.S. export wheat range from \$41 million to \$65 million, depending on the volume and point of cleaning. These estimates assume that the target dockage content after cleaning is 0.35-0.40 percent, a level of cleanliness commonly tolerated by cleanliness-conscious foreign buyers and comparable with that of "clean" wheat exported from Canada and Australia. Wheat loss (the loss of revenues resulting from the removal of shrunken and broken kernels, whole-kernel wheat, and FM during the cleaning process, which can only be sold as screenings) is the largest cost component in cleaning wheat at elevators, accounting for about 80 to 85 percent of the total costs of cleaning.

Wheat cleaning costs, as presented in this section, are easier to identify and estimate than estimates of potential premium and trade benefits reported in the next section. The cost estimates are based on the economic-engineering studies—an approach for assessing the cost-output relationship for a production process by first separating the production activities into stages and then estimating the input-output relationships at individual stages of a production operation.⁵ Marginal cleaning costs could potentially decline over time as cleaning technologies become more efficient. In contrast, the estimates of benefits from premiums for cleaner wheat and increased trade volumes are largely derived from interviews with foreign buyers, reflecting how they think they would react if the United States exported cleaner wheat.

Producer Practices

The additional costs of delivering cleaner wheat by changing harvesting and handling practices are likely to be greater than any potential benefits realized in the form of lower discounts. It is also doubtful that cleaning

⁴An elevator is an establishment that operates facilities for receiving grains from producers or other elevators and shipping grains by truck, rail, or barge to processors, other elevators, or overseas markets.

⁵These studies were conducted by a group of engineers and economists at the Oklahoma State University for winter wheat and at the North Dakota State University for spring wheat.

wheat at the farm would be economically feasible. Eighty-one percent of wheat producers responding to a 1991 survey indicated they could not deliver cleaner wheat by changing harvesting and handling practices without incurring additional costs (Hyberg and others).⁶ The survey of farmers indicated that only 24 percent of wheat farmers own grain cleaners. Only 38 percent of the farmers that own cleaners used them for cleaning wheat for market, implying that fewer than 10 percent of wheat farmers clean wheat before marketing (Hyberg and others).⁷

To provide cleaner wheat, in addition to mechanical cleaning, farmers can alter their production and harvesting practices and they can clean trucks, augers, and storage bins before use. Weed seed can be reduced by planting certified seed, altering crop rotations, applying herbicides, or increasing cultivation before planting.⁸ However, each one of these activities has a cost. For example, certified wheat seed is typically priced double the cost of conventional varieties (USDA, National Agricultural Statistics Service). Also, the viability of using pesticides to reduce the dockage content of wheat at harvest may be reduced in future years because of public concerns expressed about nonpoint water pollution and pesticide residues on food. Harvesting practices can be altered through careful adjustment of combines to reduce dirt and weed seed. The adoption of direct combine harvesting rather than windrowing is an option for spring wheat growers; however, this would require greater drying time in the field and would delay harvest.

Country and Subterminal Elevators

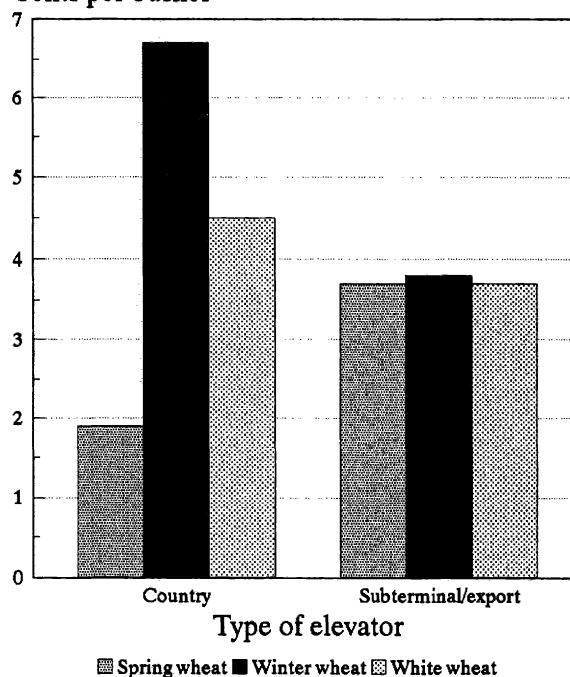
The costs of additional cleaning of U.S. export wheat at country and subterminal elevators exceed the benefits in domestic markets. The least net-cost location for additional cleaning is at subterminal elevators for winter wheat, and at country elevators for HRS and durum wheat.

Country and subterminal elevators have the same basic incentives to demand and supply cleaner wheat. The differences in the incentives facing an elevator are largely due to its customers and the source of the elevator's wheat. Elevators that deal with export terminals will tend to face a demand for cleaner wheat, which reflects the effects of nonwheat material on transportation and storage costs. These elevators will in turn use price incentives to acquire wheat that satisfies this demand. Alternatively, these elevators may find it more profitable to buy less-clean wheat and supply cleaner wheat through additional cleaning. Elevators primarily serving domestic flour mills will have little incentive to clean wheat (Hyberg and others).

The net cost of cleaning spring wheat at export elevators is greater than that at country elevators because of higher fixed costs, reduced revenue from sales of screenings, and higher value of wheat loss. Per bushel costs of cleaning at country elevators for a volume equivalent to total U.S. wheat exports ranged from 1.9 cents for spring wheat to 6.7 cents for winter wheat in 1991, as shown in figure 2 (Hyberg and others). The total cost of cleaning this volume at country elevator locations is estimated to total \$65 million--\$6 million for HRS and durum wheat, \$10 million for white wheat, and \$48 million for winter wheat (table 1).

Cleaning winter wheat at subterminal elevators is more cost effective than cleaning at country elevators because of higher throughput and lower fixed costs. Over all, subterminal elevators are the least-cost location for cleaning winter wheat. Per bushel costs of cleaning at subterminal locations for a volume equivalent to total

Figure 2
Cost of cleaning U.S. export wheat by class of wheat and location of cleaning, 1991
Cents per bushel



⁶Names in parentheses refer to sources listed in the References section at the end of this report.

⁷The remaining 62 percent of farmers used their cleaners primarily for seed cleaning rather than cleaning grain for market.

⁸For a more detailed analysis of options for delivering cleaner wheat, see the domestic study, *Economic Implications of Cleaning Wheat in the United States*.

Table 1--Costs and domestic benefits of cleaning all export wheat¹

Class of wheat	Point of cleaning			
	Country elevators ²	Subterminal elevators	Export elevators	Lowest net cost ³
<i>Cents per bushel</i>				
Costs of additional cleaning, per bushel:				
White	4.5	NA	3.7 ²	3.7
HRS and durum	1.9	NA	3.7 ²	1.9
Winter	6.7	3.8	NA	3.8
Benefits of additional cleaning:				
White	0.8	NA	0.8	0.8
HRS and durum	.3	NA	.2	.3
Winter	3.0	2.2	NA	2.2
Net costs of additional cleaning:				
White	3.5	NA	2.9 ²	2.9
HRS and durum	1.6	NA	3.5 ²	1.6
Winter	3.7	1.6	NA	1.6
<i>Million dollars</i>				
Costs of additional cleaning, aggregate:				
White	10	NA	8 ²	8
HRS and durum	6	NA	12 ²	6
Winter	48	27	NA	27
Total	65	NA	NA	41
Benefits of additional cleaning:				
White	2	NA	2	2
HRS and durum	1	NA	1	1
Winter	22	16	NA	16
Total	25	NA	NA	19
Net costs of additional cleaning:				
White	8	NA	6 ²	6
HRS and durum	5	NA	11 ²	5
Winter	27	12	14-19	12
Total	41	NA	31-35	23

NA = Not available.

¹Numbers may not completely agree due to rounding.

²Per-bushel cost of cleaning at export elevators for HRS and durum wheat is a conservative estimate because the cost assumes that wheat has already been cleaned to 1-percent dockage and does not include a number of indeterminate costs associated with export elevators (see Hyberg and others for details).

³Lowest net-cost point of cleaning refers to country elevators for spring wheat and subterminal elevators for winter wheat.

Sources: Derived from Adam and Anderson; Wilson, Scherping, and Johnson.

U.S. winter wheat exports is just under 4.0 cents. The cost of cleaning this volume at subterminals is estimated to total \$27 million.

The segregation of cleaned wheat at country and subterminal elevators for shipment to export elevators would reduce operating efficiency to some extent. It may not be practical in some cases where storage space

is limited, time for assembling wheat from producers during harvest is short, and segregation based on other quality factors (such as protein) offers greater profit potential. In addition, cleaning during loading, which occurs more commonly at subterminal elevators, would require more cleaning capacity. Cleaning during unloading, which is more common at country elevators, would require more storage capacity.

Country and subterminal elevators act as intermediaries as wheat moves from farms to export elevators and processors. They sort, aggregate, blend, condition, store, and handle the wheat. They encourage the delivery of wheat with the desired quality and cleanliness characteristics by offering price premiums and applying price discounts to their suppliers. In addition, they make cleaning decisions themselves in response to market premiums and discounts prevailing in the market and applied by exporters, processors, and other users of wheat in procurement operations. The elevators create their market niche by responding to differences in demand for different grain characteristics. They obtain, bundle, and supply shipments of wheat according to each buyer's willingness to pay for it.

Export Elevators

Costs of cleaning wheat at port elevators is higher than at country or subterminal elevators. Fixed costs are definitely higher at port elevators because physical space is limited and expensive, higher capacity cleaning machines are needed to accommodate the high volume, and additional elevation legs would have to be constructed at many locations (Adam and Anderson; Fridirici and others).⁹ In addition, the value of wheat, FM, and shrunken and broken kernels removed in cleaning (commonly called wheat loss) is likely to be greater at port elevators because the price of wheat is typically higher at port elevators due to additional handling and transportation costs. Per bushel costs of cleaning spring wheat at export elevators is about 4 cents.

Like country and subterminal elevators, port elevators signal incentives or disincentives for cleaning to their suppliers (subterminal or country elevators) by applying market premiums and discounts to purchases. In addition, they make cleaning decisions based on foreign buyers' contract specifications regarding cleanliness, and premiums or discounts applied on shipments to them by foreign buyers.

Benefits of Cleaning Wheat

Cleaning wheat has potential benefits in both domestic and international markets. Domestic benefits occur in the form of lower handling, storage, and transportation costs as wheat moves from farms to export points and in the form of revenues generated from sales of screenings. International benefits stem from any premiums foreign buyers are willing to pay for cleaner wheat and from increases in U.S. wheat exports.

Domestic Benefits

Transportation savings and revenue derived from sales of screenings are the largest sources of domestic benefits from cleaning. In addition, wheat cleaning can result in other benefits including: lower costs for drying, aeration, storage, and insect control; smaller discounts for test weight, FM, and shrunken and broken kernels; and greater uniformity of shipments.

The major benefit to farmers delivering cleaner wheat is the potential reduction in discounts. Smaller discounts generally are not sufficient to compensate for costs associated with changing production and harvesting practices or costs incurred through mechanical cleaning in order to deliver a cleaner product. Based on economic-engineering studies, net returns for cleaning on the farm range from -12 cents to +4 cents per bushel (Hyberg and others). Positive net returns for onfarm cleaning are found only in exceptional circumstances, such as large volume of wheat to be cleaned by large farms and the high value of screenings.

The gross benefits of cleaning wheat at country elevators are higher than those at subterminal elevators. Most potential savings from reduced transportation, aeration, and fumigation expenses, and higher value of screenings are captured at the country elevator level. Per bushel domestic benefits from cleaning all export wheat at country elevators are estimated at 0.3 cent per bushel for HRS and durum wheat, 0.8 cent for white wheat, and 3.0 cents for winter wheat (table 1). In contrast, the benefits are only 0.2 cent per bushel for spring wheat and 2.2 cents for winter wheat if cleaning is done at export or subterminal elevators. Gross domestic benefits from cleaning a volume equivalent to total wheat exports at these terminal elevators are estimated to total \$19 million--\$1 million for HRS and durum wheat, \$2 million for white wheat, and \$16 million for winter wheat (Hyberg and others).

Cleaning spring wheat at export elevators would result in benefits smaller than those at country and subterminal elevators because of little transportation savings and lower revenues from sales of screenings. Similarly, the benefits of cleaning winter wheat are higher at subterminal elevators than at port elevators because screenings do not have to be shipped as far, and savings in transportation costs from cleaning are greater when

⁹Elevation lags, commonly called bucket elevators, are vertical conveyors that receive grain from a dump pit or some kind of dump conveyor at the base level and discharge grain from the top, which typically is 150-200 ft. in height from the base level, to any receiver, such as vessel, train, truck, or barge.

wheat is cleaned at subterminal elevators. In cases where there is a byproduct feed market for screenings, revenues from sales of screenings at port elevators would likely be smaller than at subterminal elevators, since port elevators are less likely to be located near livestock feeding areas.

International Benefits

The international component of this study examines the role of quality in wheat import decisionmaking in the world market and assesses the effects of selling cleaner U.S. wheat. Traders, millers, and officials in state trading agencies in 18 importing countries were interviewed for this study. The countries studied typically receive 70 percent of U.S. wheat exports.

The potential international benefits from selling cleaner U.S. wheat in international markets come from two sources. First, price enhancement may result from foreign buyers' willingness to pay a higher price for cleaner U.S. wheat. Second, trade enhancement may result from foreign buyers' being willing to purchase more U.S. wheat if it is cleaned or to retain U.S. market share which otherwise might be eroded by competitors.

The benefits of price and trade enhancement must be treated separately in order to place the benefits on the same common basis (that is, net returns) for the U.S. grain industry. In the case of price benefits, the calculation is relatively straightforward. An increase in U.S. grain traders' profits is equivalent to the increase in the traders' export revenues minus the domestic net costs of cleaning. Since the domestic net costs of cleaning have been covered earlier, premium benefits in this section are expressed in terms of the increase in export revenues.

In the case of trade benefits, an increase in U.S. grain traders' profits becomes more complicated. First, the increase in U.S. grain traders' export revenues must be computed by multiplying export price (f.o.b.) adjusted by the Export Enhancement Program (EEP) bonus by the increase in U.S. wheat exports.¹⁰ The EEP bonus must be subtracted from the export price. About 60 percent of U.S. wheat exports are assisted through EEP. Second, the costs of producing the additional exported wheat, costs of moving that extra amount of wheat from the farm gate to the export ports, and additional costs of cleaning must be subtracted from the gross value of increased export revenues.¹¹ These adjustments are made to ensure that profits from trade enhancement are placed on the same basis as the price benefits. The additional costs of cleaning also need to be factored into this calculation because the costs of cleaning reported in table 1 do not include additional wheat exports.

For importing countries where buyers are willing to pay a premium or increase U.S. wheat imports (but not both), there is less concern about whether the trade benefits might be overstated. The more common cases where buyers expressed interest in responding to cleanliness considerations through both price premiums and volume adjustment require careful interpretation. Since foreign buyers were asked whether the import quantity of clean U.S. wheat would change in the absence of a price change, the total international benefits cannot be determined by simply adding the trade effect directly obtained from interviews to the premium benefits in these cases. The "true" trade effect, beyond the premium benefits, is likely to be largely dissipated, if foreign buyers are asked to pay a higher price for cleaner U.S. wheat.

U.S. Wheat Prices

Foreign buyers in a few interviewed countries (Japan, Venezuela, the Philippines, Italy, Togo, and Ghana) indicated a willingness to pay premiums for cleaner U.S. wheat (Mercier). These price differentials generally range from \$1 to \$5 per metric ton (table 2). Based on these premiums, the increase in U.S. wheat export revenues would amount to \$13.3 million in the short run.

Even though the world wheat market is represented in this study as one of differentiated products, the premiums foreign buyers are willing to pay may not be sustained over a longer period as the world supply of cleaner wheat increases. As the supply of clean wheat increases, the Canadian Wheat Board (CWB) and Australian Wheat Board (AWB) would have to lower their prices to maintain market share. This would reduce the pooled profits distributed to their wheat producers. In addition, with the CWB and AWB no longer able to offer cleaner wheat as a selling point over U.S. wheat, they may have to stress their sales servicing advantage, which could increase operating costs.

Moreover, selling cleaner wheat could be advantageous to the United States by enhancing its price competitiveness if it alters the relationship between U.S. and competitors' wheat prices in cleanliness-conscious markets. A change in the price relationship could stem from a decline in the premium for the competitors' wheat or an increase in the price for cleaner U.S. wheat. This

¹⁰Under the EEP, U.S. exporters compete for sales to the targeted market expecting that they will bid for and receive a bonus, which is awarded to the exporters whose sales price and bonus bid fall within an acceptable range. The bonus typically is awarded to U.S. exporters so that U.S. wheat can be sold to the targeted markets at the world price.

¹¹Expanded wheat production and exports, however, would generate indirect benefits by increasing economic activities and income in the farm inputs supply and marketing sectors.

Table 2--Premium benefits from selling cleaner wheat

Country	Imports of U.S. wheat ¹	Premium willing to pay for cleaner U.S. wheat
	<i>Million metric tons</i>	<i>Dollars per metric ton</i>
Ghana	0.08	5-15 ²
Italy	.41	4-8
Japan	3.64	Possible (likely around \$2/mt)
Philippines	1.36	Possible (likely around \$1/mt)
Togo	.07	5-20 ²
Venezuela	.37	3-5
Total	5.93	--

-- = Not applicable.

¹Import data represent primarily 1991 or 1992 figures.

²Likely at the bottom-end of the range.

altered price differential would thus enhance price competitiveness for U.S. wheat and increase U.S. wheat sales. On the other hand, if the prices of U.S. wheat increase because of cleaning, the volume exported to other price-sensitive markets could decline, offsetting the potential benefits.

U.S. Exports

Offering cleaner U.S. wheat could enhance U.S. exports modestly over current levels in certain high-protein or low-dockage markets. Annual U.S. wheat exports could potentially increase by 400,000 to 700,000 tons in these markets (including Italy, Brazil, Venezuela, China, Togo, and Ghana) as a result of delivering cleaner wheat at current prices (table 3)(Mercier). U.S. wheat exports to all these countries represent about one-quarter of U.S. wheat exports in a typical year. The increase would be about a 2-percent increase in U.S. wheat exports. If foreign buyers are required to pay a higher premium price, the trade effect would likely be reduced to 160,000-410,000 tons.

Improving the cleanliness of all U.S. export wheat could potentially hurt U.S. exports in price-sensitive markets. In addition, the benefits from improved cleanliness could quickly diminish due to competitive pricing or other actions by our competitors. Also, it must be recognized that responses from respondents are hypothetical reactions to unobserved conditions so respondents could be exaggerating their estimated purchases, particularly if world prices were to go higher. More important, the 2-percent increase in U.S. wheat exports or retention of U.S. share of the world market, in addition to premium

Table 3--Increases in U.S. wheat exports from selling cleaner wheat (no change in prices paid by foreign buyers)

Country	Imports of U.S. wheat ¹	Potential increases in sales of U.S. wheat
	<i>Million metric tons</i>	
Brazil	0.66	0.10
China	6.20	.06-.31 ²
Ghana	.08	.023
Italy	.41	.15-.20
Togo	.07	.01
Venezuela	.37	.07
Total	7.79	.41-.71

¹Import data represent primarily 1991 or 1992 figures.

²Even though officials of the China National Cereal, Oils, and Foodstuffs Import/Export Corporation (CEROILS), a state trading agency, indicated that China would be willing to import 1-30 percent more U.S. wheat if cleaner wheat were delivered at the same price they are currently paying, an increase of 1-5 percent is considered more likely. Trade effect here is computed from the 1-5 percent likely increase.

benefits, must be regarded as optimistic because it is based on the assumption that foreign buyers would pay no more for cleaner U.S. wheat. Increases in U.S. wheat exports to Ghana, Italy, Togo, and Venezuela would likely be much less if foreign buyers were asked to pay premium prices for cleaner U.S. wheat. Thus, shortrun gains in terms of expanded U.S. wheat exports would be reduced to 160,000-410,000 tons (or an average of 300,000 tons), primarily through the increases in U.S. wheat imports by Brazil and China.

Accordingly, the U.S. wheat industry, in addition to the \$13 million price benefits, would potentially benefit by about \$2.0 million from the increase of 300,000 tons of U.S. wheat exports. First, revenue from U.S. wheat exports would increase by about \$34.5 million, assuming a \$115-per-metric-ton f.o.b. export price (the world price after deducting EEP bonus) for 1992. However, the net benefit of this increase in export revenues would be reduced by the \$25.4 million cash costs of production (based on cash costs of \$2.30 per bushel), \$6.6 million transportation costs from the farm to the export port (based on a \$22-per-metric-ton transportation rate), and an additional \$0.5 million costs of cleaning (based on a 4-cents-per-bushel cleaning cost).¹²

¹²The additional costs of cleaning also need to be factored into this calculation because the costs of cleaning reported in table 1 do not include this additional 0.3-million-ton increase in U.S. wheat exports.

A small increase of 500,000 tons in U.S. exports (assuming no price change) would likely require a minor price increase at the farm level, perhaps \$0.75 to \$1.50 per ton (2 to 4 cents per bushel), in order to pull milling-quality wheat out of domestic consumption or induce a small increase in area planted (Mercier). The higher prices would increase farm receipts, but lower deficiency payments. However, EEP bonuses would become higher in order to offset the higher farm price if foreign buyers were given the opportunity to purchase cleaner U.S. wheat at the same price they are paying now.

There is no indication that cleaner U.S. wheat would increase world trade volume. Foreign flour millers now have cleaning capacity in place and do their own cleaning just as U.S. flour millers do. World export demand is largely saturated, given the large exporter subsidies in general use, and cleaner wheat would influence where grain is bought far more than how much is bought.

The \$2.0 million (the midpoint of the range from \$1.1 million to \$2.9 million) in net benefits from slightly larger U.S. exports must be regarded as an upper bound (at least for countries surveyed) because costs of cleaning will potentially lead to higher U.S. wheat selling prices which, in turn, would diminish U.S. competitiveness in price-sensitive markets. Foreign buyers in these markets appear to be indifferent to the offer of cleaner wheat, and could well switch their purchase to other exporters. Even just a hypothetical 5-percent decline in U.S export share in these developing countries (such as Morocco, Pakistan, and Sri Lanka) could reduce U.S. exports by

more than 0.5 million tons or induce the United States to offer higher EEP bonuses in order to maintain market share (Mercier).

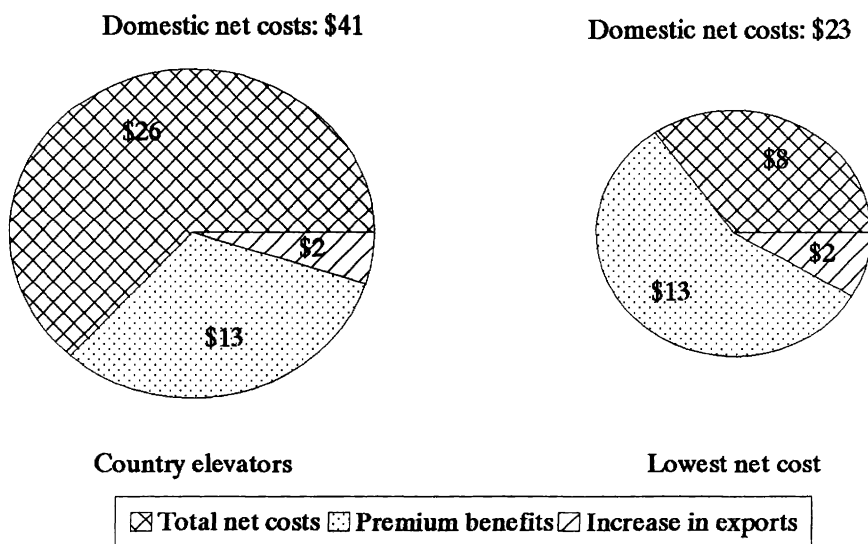
The modest benefits from an increase in U.S. wheat exports could further be reduced if competitors respond by lowering their wheat prices or by offering better quality wheat. Canada and Australia could do little to improve the cleanliness of their export wheat since they have already achieved low levels of dockage by mandatory cleaning. In some quality-sensitive markets, such as Venezuela and Italy, the Canadian Wheat Board evidently has used the delivery of wheat with a protein content above contracted levels, in combination with price discounting, as a means of securing market share. France and Argentina are unlikely to institute additional cleaning and so are more likely to rely on price adjustments as a countermeasure.

Net Costs of Cleaning Wheat

Would international benefits (combined premium benefits and trade effects) from selling cleaner wheat be sufficient to compensate for the domestic net costs of \$23 million that would be incurred in cleaning all U.S. export wheat at lowest net-cost point (country elevators for spring wheat and subterminal elevators for winter wheat)? In the short run, the costs of cleaning all export wheat to a dockage level of less than 0.5 percent would outweigh the benefits (including those in domestic and international markets) by at least about \$8 million if cleaning was done at the lowest net-cost point (fig. 3). The

Figure 3

Domestic net costs versus international benefits¹
(in million dollars)



¹International benefits include price premiums and increase in U.S. wheat exports.

Table 4--Annual costs and benefits of cleaning all export wheat¹

Item	Cost or benefit
<i>Million dollars</i>	
Costs of cleaning (lowest net-cost point):	
HRS and durum	6
White	8
Winter	27
Total	41
Domestic benefits:	
HRS and durum	1
White	2
Winter	16
Total	17
Domestic net costs of cleaning (lowest net-cost point)	23
Subtract benefits from international markets:	
Premiums	13
Trade effects (at the premium price)	2
Total	15
Total net cost	8

¹Figures may not add due to rounding.

international benefits from selling cleaner wheat totaled about \$15 million--\$13.3 million in price premiums and \$2.0 million in trade effects (table 4), not enough to offset net domestic costs. Total net costs (net domestic costs of cleaning minus benefits from international markets) of cleaning would be even greater if cleaning were done at country elevators, reaching \$26 million. Hence, cleaning all U.S. export wheat above and beyond the current level is not economically feasible, even when shortrun international benefits are taken into account.

Importers' Purchase Decisions

The selection of a supply source in the world wheat market is influenced by cleanliness, price considerations, quality considerations, and other competitive factors. Wheat price, instead of quality, was the most important criterion in many lower income countries (Mercier). Discussions with foreign buyers revealed that cleanliness is generally not the most important consideration. Each importer had a unique set of preferences, which are summarized in this section.

Importance of Dockage

Within the general category of quality factors, wheat cleanliness, or more specifically dockage content, plays a less important role than other quality attributes in the import decisionmaking for many countries. There are exceptions. For example, disposal of screenings in some countries is costly due to environmental problems. In other cases where there is fierce competition for market share (as in Togo and Ghana), higher dockage content in U.S. wheat distinguishes it in a negative way from the cleaner Canadian wheat.

Most millers regard dockage as a nuisance that raises shipping and cleaning costs slightly, but it is generally considered to be of less importance than other quality factors. In some countries (such as Indonesia and Sri Lanka), some dockage is actually welcome because flour prices are state-controlled but millfeed prices are market-driven, and screenings are an important source of revenues for millers.

Most countries include dockage in the contract specifications for purchasing wheat (table 5). The importance of dockage to a particular country may be reflected by the treatment of dockage in its contract specifications. For example, a maximum dockage of 0.9 percent is allowed in Sri Lanka while a zero-dockage allowance is specified in the contract by the Taiwan Flour Millers Association. In Sri Lanka, some dockage is welcome while in Taiwan, concerns over air pollution and the administratively-determined base price paid by flour millers for imported wheat, which was often much higher than the world price, make dockage highly undesirable (Landes and Ash; Huang and Lin).

The importance of dockage in some other countries goes beyond the concern over wheat cleanliness itself. For example, concern about weed seed and live insects in U.S. wheat imported by CEROILS, the buying agency for the People's Republic of China, would be largely eliminated by cleaning. The presence of dockage often contributes to insect infestation and quarantine related problems, such as Johnson grass seed in China (Crook, Lin, and Colby).

Cleanliness and Uniformity as Competitive Factors

Canada and Australia are the major competitors with the United States in quality sensitive markets. Foreign buyers generally regard Australian and Canadian wheat to be superior to U.S. wheat with respect to protein (except in some Asian markets), cleanliness, and uniformity. The dockage content of U.S. export wheat averages about 0.7 percent in recent years compared with an average dockage content of about 0.3 percent in

Table 5--Contractual specifications for dockage

Country	Level (percentage)	Country	Level (percentage)
Brazil ¹	1.0 nondeductible	Philippines	.5 nondeductible
China	.1 nondeductible	Russia	.5 nondeductible
Egypt	.4-.8 nondeductible	South Korea	1.0 maximum
Ghana	3.0 maximum	Sri Lanka	.9 maximum
Indonesia	.5 nondeductible	Taiwan	0 nondeductible
Italy ¹	2.0 maximum	Togo	2.0 maximum
Japan	.8 maximum	Tunisia	.8 maximum
Morocco	1.0 maximum	Venezuela	1.0 maximum, .5 nondeductible
Pakistan	.5 nondeductible	Yemen	1.2 maximum

¹Specifications refer to impurities rather than dockage.

Canadian and Australian wheats (Mercier). Many foreign buyers indicated on the survey that they have seen improvements in the cleanliness of U.S. wheat exported to their country over the last few years. The export inspection data available from FGIS supports these observations. Tightening the standards for the Shipload Inspection Plan (the Cu-Sum Plan) in the late-1980's by FGIS was designed to improve U.S. cleanliness and uniformity of U.S. export wheat. Also, foreign buyers regard U.S. wheat quality as superior to the quality of EC and Argentine wheat. Wheat sold by Argentina and the EC contains a higher dockage level than U.S. wheat. Wheat exported from these sources frequently competes with U.S. wheat in the low-income, price-sensitive markets.

Lack of uniformity with respect to the intrinsic characteristics and cleanliness factors in U.S. wheat is a source of dissatisfaction or irritation for most importers. U.S. farmers grow five classes of wheat in regions with different climatic conditions. A large number of varieties within each class are available to producers, and the various varieties that are grown are commingled in the marketing channel. The proliferation of varieties is a major contributor to the variability of end-use characteristics that exist in U.S. export shipments. On the other hand, a diverse selection of varieties is essential to addressing the wide-ranging environmental circumstances that face U.S. farmers. A strength of the U.S. wheat industry is to offer various classes of wheat to meet the needs of a wide range of different end-users. What becomes important is the ability to supply those diverse buyers with the characteristics they most want in a consistent manner.

Canada and Australia, in contrast, have adopted strategies to enhance uniformity of quality in exported grain. Variety control regulations in these countries have the effect of reducing variability in their wheat. Also, mandatory cleaning at either inland or export terminals in these countries ensures more uniform quality in their exported wheat. Finally, quality uniformity in Canadian and Australian wheats is further strengthened by their identity preservation program. In short, Canadian and Australian systems have traded flexibility to facilitate the export of a uniform product. Canada and Australia export at least 70 percent of what they produce, whereas the United States consumes about 45 percent of its production domestically.

Price versus Quality Considerations

The importance of quality consideration in importers' purchase decisions is strongly related to their income levels. Wheat price, not quality, is the most important criterion in many lower income countries (including China, Egypt, Indonesia, Morocco, Pakistan, the Philippines, and Tunisia), which along with the former Soviet Union states, account for a majority of world wheat trade (table 6). In contrast, some high- to middle-income countries, including Italy, Venezuela, and South Korea, which account for less than 20 percent of the world market, value quality ahead of price as the priority criterion due to very specific end-use demands for the imported wheat (Mercier). However, these three countries do not rank cleanliness as their prime quality concern, even though it is often the primary problem for U.S. wheat compared with competitors.

Table 6--Importers' ranking of sourcing factors by country

Country	# 1	# 2	# 3	# 4
Brazil	Price	Quality	Credit	Trade servicing
China	Price	Quality	Government trade relationships	
Egypt	Price	Credit	Quality	
Ghana	Trade servicing/ relationships	Quality	Price	
Indonesia	Price	Quality	Company/agency relationships	
Italy	Quality	Price	Trade servicing	
Japan	Trade relationships	End-use requirements	Reliable supplier	Quality
Morocco	Price	Credit	Quality	Government trade relationships
Pakistan				
Private:	Price	Rapid delivery	Quality	
Government:	Credit/grants	Price	Minimum quality specifications	Ability to meet delivery terms
Philippines	Price	Quality		
Russia	Credit	Price	Quality	
South Korea	Quality	Price	Credit	Trade servicing
Sri Lanka	Grants	Bilateral trade relations	Price/credit	Minimum quality specifications
Taiwan	Government trade relationships	Quality	Price	
Togo	Trade servicing/ relationships	Price	Quality	
Tunisia	Price			
Venezuela	Quality	Price	Trade servicing	
Yemen	Price	Credit	Quality	Trade servicing

#1 designates most important factor(s).

/indicates factors were tied in ranking.

Within the general category of quality factors, most countries regard the intrinsic characteristics of imported wheat as more important than its physical cleanliness. The prime quality criterion for the majority of the countries studied is protein quality (or gluten quality) and quantity (table 7). Concerns with protein stem both from levels of protein seen in U.S. wheat (too low in some HRS shipments and too high in some white wheat shipments) and the variability of protein quality. Other quality factors, such as test weight, sprout damage, and moisture content are also high in importers' preferences. Some countries also have phytosanitary or quarantine requirements (such as pesticide residues, live insects, or certain noxious weed seeds) that they regard as critical.¹³

The importance of quality also depends on whether wheat purchases are done through private or public trading. Among importers for which net price (and the factors that comprise it, including subsidy rates, credit terms, and food aid) is the key factor, quality tends to rank second in importance where trading is at least partially in private hands (Mercier). In these markets, end-users have some access to the traders who strike the deals and have an opportunity to influence the quality specifications in the purchase contract.

In contrast, low-income countries (such as Sri Lanka and Tunisia) that engage in state trading and try to obtain the maximum amount of wheat for a given amount of money, are less prone to emphasize quality in their import decisionmaking. Often, these countries are also recipients of food aid and have little flexibility in determining the source for the bulk of their wheat imports. Government trade relationships also play an important role in many importing countries' purchase decisions. Importers that consistently have a merchandise trade surplus with the United States (such as Japan, Taiwan, and China) are often sensitive to maintaining the U.S. share of their wheat imports in order to reduce political friction. To a lesser extent, some low-income countries (such as Ghana, Sri Lanka, and Togo) also view government trade relationships and trade servicing as important factors in their import decisions.

Institutional Factors

This section discusses institutional factors of the purchasing organization, the U.S. multiple-firm selling system versus single-desk selling agencies of Canada and Australia, and difficulties encountered by relying on contract specification as a tool to meet foreign buyers' quality needs. The discussion focuses on institutional factors such as contract specifications, programs to improve quality determination, and incorporating quality as a criterion in determining EEP bonuses.

The institutional structure of the purchasing organization is important in import decisionmaking. Monopoly buyers, especially when they are government agencies, are not always fully responsive to the quality needs of flour millers and bakers. Thus, monopoly buying agencies do not necessarily reflect quality demands of end-users in contract specifications. In these cases, grain traders, such as those from the United States, who rely on contract specifications as a signal of end-user needs, often try to meet minimum contract requirements but do not necessarily satisfy the end-user. U.S. competitors--chiefly CWB and AWB--are in a better position than the United States to address this problem because they acquire information about quality needs of end-users through an active customer outreach program and after-sales services. Thus, Canada and Australia have more information on the quality needs of specific end-users, and can selectively supply these needs by offering better-than-contract quality wheat.

Contract Specification

At present, contract specification focuses on indicating the nondeductible level and the maximum limit of dockage, as shown in table 5. Dockage content is deducted from the gross weight of shipments if it exceeds the nondeductible level. In addition, dockage is subject to penalties in a few countries, such as Taiwan and Japan, once it exceeds the maximum limit in the contract. However, U.S. wheat is perceived to contain a higher dockage level than Canadian and Australian wheat in nearly 20 percent of U.S. export markets that are cleanliness-conscious.

Cleanliness in U.S. wheat, in general, does not improve because of the specification of the nondeductible level of dockage in sales contracts. First, the contract maximum limits or nondeductible levels are often set by foreign buyers above 0.5 percent in the cleanliness-conscious markets. In addition, the costs of cleaning are believed to exceed any benefits from avoiding the deduction of dockage from the gross weight and penalties resulting from exceeding the contract limit. For example, in the case of Taiwan where zero-dockage is allowed and stiff penalties are applied whenever dockage exceeds zero, benefits from delivering dockage-free wheat by U.S. exporters would amount to about \$1.70 per metric ton (Huang and Lin).¹⁴ However, costs of cleaning wheat in many port elevators would likely exceed that level, even

¹³Pesticide residues, live insects, and noxious weed seeds are closely related to the dockage level in wheat--cleaner wheat tends to have less problems with live insects or weed seeds. Also, pesticide residues tend to concentrate in dust and fine material.

¹⁴Taiwan is one of few importing countries that imposes penalties on top of deductions whenever dockage content in wheat shipments exceeds the contract limit.

Table 7--Ranking of quality factors based on country interview results

Country	# 1	# 2	# 3	# 4
Brazil	Gluten quality	Protein quantity	Impurities	Color
China	TCK smut/insects/ Johnson grass seed	Pesticide residues	Dockage	Protein quantity and quality
Egypt	Live insects/ dead insects	Moisture	Foreign material	Test weight
Ghana	Dockage	Moisture	Protein content	
Indonesia	Protein	Foreign material	Shrunken and broken kernels	Test weight
Italy	Gluten quality	Protein quantity	Stability	Cleanliness
Japan	Protein content	Quality variability	Dockage	Chemical residue
Morocco	Test weight	Dockage	Protein quantity	Moisture
Pakistan	Moisture	Gluten quality/ wheat hardness	Color	
Philippines	Protein quality	Gluten quality/ test weight	Kernel size	Falling number
Russia	Gluten content	Moisture	Wheat hardness	Nonmillable material
South Korea	Protein/gluten	Sprout damage	Amylograph	
Sri Lanka	Protein quality	Moisture	Test weight	
Taiwan	Gluten quality	Moisture	Protein quantity	Dockage
Togo	Dockage	Moisture	Protein quantity	
Tunisia	Protein quantity	Moisture	Dough elasticity (W)	
Venezuela	Gluten quality	Protein quantity	Sprout damage	Dockage/ test weight
Yemen	Dockage	Gluten quality	Test weight	Moisture

#1 designates most important factor(s).

/indicates factors were tied in ranking.

TCK, *Tilletia Contraversa Kuhn*, is a winter wheat disease.

if it were technically feasible to remove all dockage--an assumption that is widely regarded as doubtful. The difference between costs of cleaning and benefits from avoiding weight deductions would be even greater in other less-stringent importing countries.

An approach to improve the cleanliness of U.S. wheat for shipments to these niche markets is to make the "clean wheat" contract specification available to buyers in these markets as an option, in addition to the current system. Under this contract option, the level of premium foreign buyers in cleanliness-sensitive markets are willing to pay for will be specified in the contract; that is, to indicate that they meant what they said. U.S. grain traders can respond by delivering cleaner wheat through additional cleaning or other means, knowing ahead of time that buyers in these niche markets are committed to paying a premium for cleaner wheat at a level that can more than compensate for the costs of cleaning.

U.S. exporters will find the notion of targeting wheat cleaning to selected niche markets more attractive if uncertainty about the expected premiums can be diminished. The exporters can then decide whether to target wheat cleaning after weighing premium benefits from selling cleaner wheat against costs of obtaining cleaner wheat.

A hurdle to overcome before this "clean wheat" specification becomes operable is the inertia in changing contract specifications in many importing countries. An information (outreach) program, discussed later, could be implemented to familiarize foreign buyers with the merits of electing a "clean wheat" contract specification in lieu of the current system.

Programs To Improve Methods To Measure Quality

Communicating buyers' quality needs and U.S. wheat quality between foreign buyers and the U.S. wheat industry requires an accurate and rapid measure of wheat quality attributes. Currently, there are knowledge and communication gaps in the marketing chain concerning end-use quality characteristics and their value. The only market information available pertaining to end-use characteristics of wheat are its class and protein content, although test weight can serve as a proxy for milling yield. Low-cost, rapid, objective testing equipment that can be used at country elevators to measure end-use quality attributes are not yet available. Thus, an option worthy of further advancement is to accelerate the development of technologies to accurately and rapidly measure wheat quality attributes currently underway. Since foreign buyers are primarily concerned with intrinsic characteristics of wheat quality (such as gluten quality) and some of these attributes are not yet

measurable in a massive scale, more emphasis on this aspect of quality measurement and reporting, and more public funding for programs to improve quality determination would be very useful.

Developing these quality-testing technologies would be especially critical to a market segregation program, which would segregate wheat in the marketing channel on the basis of intrinsic characteristics that affect end-use performance. Currently, there are methods which can identify intrinsic characteristics in the marketing channel, and these are used in other exporting countries (U.S. Congress, OTA). However, segregating wheat through the marketing system must have the support of proxy methods to measure end-use characteristics.

Incorporating Quality As a Criterion Under the EEP Sales

It has been suggested that U.S. export programs have unintentionally lowered the cleanliness and quality of U.S. wheat exports. The EEP tends to reduce the margin by which foreign buyers' contract requirements are to be met (Larue and Lapan). This may result in higher dockage levels since U.S. grain exporters focus on loading near all contract limits.

Some grain traders have suggested using quality bonuses under the EEP payable to U.S. exporters who achieve quality goals to enhance the cleanliness of U.S. wheat exports. Such bonuses would enhance U.S. wheat quality competitiveness in certain import destinations (U.S. Congress, OTA). An argument for this option is that Canada and Australia meet the quality needs of end-users by using their monopoly selling organizations and their active information outreach programs. To compete with Canada and Australia, the United States may want to consider incorporating quality as a criterion in awarding bonuses under the EEP to end the current practice of relying on contract specifications to meet end-users' quality needs. Incorporating quality as a criterion under the EEP should be coupled with an active information outreach program to ensure the program is effective in identifying and meeting end-user quality needs.

Incorporating quality as a criterion under the EEP would entail additional administrative costs. Implementing such a concept for the EEP would also impose additional complications in identifying quality factors that are important to each buyer and in determining the value of the higher level of quality to that buyer.

Policy Implications

There is no economic basis for cleaning an amount of wheat equivalent to all export wheat in the United States.

The most efficient scenario examined had a shortrun net cost of \$8 million per year. Furthermore, the net cost of cleaning wheat would be expected to increase over time.

Actions to improve intrinsic quality attributes of U.S. wheat quality might be more effective at enhancing U.S. competitiveness in the world market. Within the general array of quality factors, most buyers in importing countries regard the intrinsic characteristics (including protein quality and quantity, and sprout damage), test weight, and moisture content of imported wheat as more important than its physical cleanliness.

U.S. interests would be served best if policies were established that create incentives for the U.S. marketing system to differentiate between customers on the basis of their cleanliness preferences. Segregating clean wheat, selective cleaning, and/or transporting clean wheat through the marketing system to port elevators may reap the benefits of offering cleaner export wheat in the few markets that clearly prefer it. This approach would not incur the costs associated with cleaning all wheat destined for export markets. However, the marginal costs of marketing (mainly segregation costs) would probably increase because market segregation would slow down handling operations and thus result in loss of efficiency.

Policies designed to enhance U.S. wheat quality competitiveness in the world market should include initiatives to convey information about foreign buyers' quality preferences to domestic producers, handlers, and traders. Also, this program would reinforce efforts to familiarize foreign buyers with quality characteristics of U.S. wheat. The former should include foreign buyers' preferences for intrinsic characteristics in addition to cleanliness, and the latter should include varietal information on U.S. wheat and end-use characteristics of the varieties, options for contract specifications, and milling considerations.

Cleanliness and quality in general may play a more prominent role in foreign buyers' purchase decision in the future. Relaxing of state controls over grain trading in several countries that are currently contemplating such an action, including China, Russia, Taiwan, Ghana, Tunisia, and Morocco, could increase the impact of selectively offering cleaner wheat. Quality, especially intrinsic characteristics, could also influence an exporter's market share if per capita income continues to grow in low-to-medium income importing countries and in the quality-conscious markets. A successful outcome of the General Agreement on Tariffs and Trade (GATT) would be to reduce the use of export subsidies and also potentially reduce the interference of pricing segmentation by export subsidies and raise the importance of quality as a purchasing decision factor for

importers. Also, as food safety becomes an increasing concern and increasing sophistication in milling and baking technology requires increasingly specific contracts, wheat quality in general and cleanliness in particular would become more important in the future.

Policy Options

This section extends the scope of the study beyond what was in the domestic and international reports by including policy options not only to improve cleanliness in U.S. wheat but to position U.S. wheat to better meet foreign buyers' quality preferences, particularly those relating to intrinsic characteristics. Despite the focus of this study being on wheat cleaning, options to address foreign buyers' preferences for intrinsic characteristics are included to capitalize on information we obtained from the interviews with foreign buyers in the 18 wheat importing countries. The policy options included in this section must be further evaluated in terms of their cost-effectiveness before any serious consideration is given to them.

Policy options considered in this study include changes to the current production and marketing practices performed by wheat producers, handlers, and exporters, as well as information programs designed to meet buyers' quality needs and to enhance foreign buyers' knowledge about quality of U.S. wheat. These options go beyond amending the U.S. Grades and Standards, a traditional focus in the past.

Targeting Clean Wheat for Niche Markets

Cleaning wheat for specific cleanliness-conscious importing countries (including Italy, Venezuela, Togo, Ghana, and possibly Japan and the Philippines) could result in net gains to the U.S. wheat industry.¹⁵ Net gains from cleaning wheat for targeted markets could potentially reach \$8 to \$10 million (table 8). Cleaning wheat for these export markets suggests that the cleaning of about 6 million metric tons of wheat, or 17 percent of all U.S. wheat exports might be appropriate. This volume includes cleaning U.S. wheat exports to Japan and the Philippines where premium benefits are less definitive.¹⁶ Over time, these net gains may decline as cleaner wheat becomes more readily available.

¹⁵Despite Togo and Ghana being cleanliness-sensitive, importers in these two countries specify high contract limits for dockage mainly because of concern over paying higher prices for low-dockage wheat.

¹⁶Premiums that wheat buyers in Japan and the Philippines are willing to pay for clean wheat are less definitive because no specific numerical response was given during the interviews. Also, we assume that foreign buyers meant what they said with regard to the premiums (that is, the increases in prices would have to be paid out of their pockets).

Table 8--Potential benefits from targeted cleaning

Country	Targeted volume of cleaning	Wheat class	Port	Premium benefits	Domestic net cost of cleaning	Net benefits
<i>Million metric tons</i>			<i>-----Million dollars-----</i>			
Ghana	0.08	DNS	Gulf	0.4	0.05	0.35
Italy	.41	DNS or durum	Lake	1.64-3.28	.24	1.40-3.04
Togo	.07	DNS	Lake/Gulf	.35	.04	.31
Venezuela	.37	DNS-60% Durum-33%	Gulf	1.48	.22	1.26
Japan	3.64	HRW/HRS/WW	Pacific	7.28	2.48	4.80
Philippines	1.36	HRS/WW	Pacific	1.36	1.04	.32
Total	5.93					8.4-10.1

DNS = dark northern spring, HRS = hard red winter, HRS = hard red spring, WW = western white.

The volume of export wheat to be targeted for cleaning is limited to exports to these niche markets because it does not pay to clean export wheat to China and Brazil. Even though buyers in these two countries are willing to purchase more U.S. wheat, there would be a net cost associated with selling cleaner wheat to these two countries in the absence of a premium for cleaner wheat.

In the cases of Japan and the Philippines, targeted cleaning applies to a combination of imported hard red winter (HRW), hard red spring (HRS), and western white (WW) wheat classes. In the rest of the niche markets, dark northern spring (DNS) and durum wheats are the classes identified for targeted cleaning. Thus, targeting wheat cleaning primarily on HRS, durum, and WW wheats would be most effective in meeting major U.S. competitors--primarily Canada and Australia--head on and could enhance U.S. competitiveness in these quality-conscious markets.

Targeting wheat cleaning for these niche markets would require that cleaner wheat be shipped from various points of export, depending on the final destination of the export grain. Cleaner wheat destined for Japan and the Philippines would be shipped primarily through the Pacific ports, shipments to Venezuela and Ghana would be routed through Gulf ports, and those to Italy would be routed through the Great Lakes ports. Shipments to Togo move from both the Great Lakes and Gulf ports. Over 80 percent of the 6 million metric tons of potential exports of cleaned wheat for targeted markets are routed through the Pacific Northwest ports and are destined for Japan and the Philippines.

Unlike cleaning wheat across the board, targeting wheat cleaning for these specific markets does not impose additional costs across the entire U.S. wheat sector. In contrast, cleaning wheat across the board would provide

a service to all importers that has great value to some and little value to others. The U.S. may gain market share in cleanliness-sensitive markets but not realize either market share or price gains in other markets. On the other hand, clean wheat could command a premium in selected markets under the targeted cleaning option.

Despite potential net benefits from targeting clean wheat for the niche markets, such trades are not occurring at present time. Possible reasons for this include: (1) imperfect information about the potential gains from selling cleaner wheat, (2) distortion in the marketplace by government policies, including the EEP and price support programs, (3) possible exaggeration of the potential trade effects and premiums by foreign buyers, and (4) investment needed for installing cleaners. The free-market solution where price premiums and other economic incentives guide cleaning decisions is probably the best strategy for targeting the niche markets.

Changing Wheat Grades and Standards

The U.S. grades and standards for wheat and other grains are intended to describe the quality of grain sold in domestic and international markets, and to certify grain characteristics as accurately as practicable. The grades and standards have been instruments used to promote quality of U.S. wheat. The grades and standards address cleanliness through grade limits for foreign material and individual contract arrangements for dockage. However, as noted earlier, cleanliness in U.S. wheat does not improve because of the contract specifications on dockage content.

The U.S. grades and standards for grain have facilitated transactions between grain buyers and sellers by specifying a minimum or maximum limit for each grade-determining factor for each of the five grades of wheat.

Grades and standards generally describe the physical attributes of grain, not intrinsic characteristics. The standards generally do not determine value of quality characteristics; however, they often influence the quality of grain marketed over time. The dockage certification procedure was revised in the mid-1980's to report to the nearest tenth of a percentage point instead of being rounded to the next lower half percentage point.¹⁷

We examined a number of options within the grades and standards framework to facilitate targeting clean wheat for the cleanliness-conscious markets. While there are different ways to alter grades and standards, a more plausible approach is to establish dockage as a grade-determining factor. Under this option, different grade limits for dockage at each grade level can be set with U.S. No. 1 being the "clean wheat" grade meeting the cleanliness needs of foreign buyers in the niche markets. Grade limits for all other grade-determining factors would remain unchanged. Establishing dockage as a grade-determining factor signals to foreign buyers that there is a "clean wheat" grade for them to purchase. However, buyers in price-sensitive markets may choose to buy other grades of U.S. wheat. This option would be preferred to one that combines dockage and FM into a single grade-determining factor because: (1) FM generally has a higher value than dockage as a feed ingredient, and (2) while dockage can be removed through cleaning, FM will be mostly remain in the wheat after dockage is removed through cleaning.

There are arguments for and against making such a change in the U.S. wheat grades and standards:

- Pros:
- Selected changes would be welcomed by some foreign buyers because such changes effectively indicate that a preference for cleaner wheat is a normal, permanent part of the international market and not just a minor, temporary occurrence that could be satisfied through individual contractual arrangements.
 - Since dockage is already measured and reported for official U.S. Grade Certificates, making it a grade-determining factor would not create additional administrative costs for FGIS or raise inspection fees paid by exporters.
 - This option would reduce uncertainty about the total amount of nonmillable material that would be received when purchasing a particular grade of wheat. Consistency among grades and classes may be important to some buyers that switch between grades and classes to satisfy certain quality objectives. They would then know that purchasing a lower numbered grade

would usually result in lower transportation and cleaning costs.

- Finally, including dockage as a grade-determining factor would facilitate the Commodity Credit Corporation (CCC) in implementing a market-based discount for dockage, and to lower the dockage content at the farm gate.

- Cons:
- Wheat cleanliness is fully described under the current standards because the level of dockage is measured and recorded on official U.S. Grade Certificates.
 - Even though cleanliness is a quality criterion in some foreign buyers' import decisionmaking, dockage is not the most important quality concern for most foreign buyers and improved cleanliness is not the most important component in answering the question of how to expand U.S. wheat exports.
 - Making changes in the U.S. wheat grades and standards in the interest of targeting the export of clean wheat to selected niche markets may be unwarranted because of their relatively small portion of U.S. export markets. Segregation costs for clean wheat could further reduce the size of the niche markets.
 - Establishing dockage as a grade-determining factor may not necessarily produce cleaner wheat if price discounts for dockage are not enough to induce additional cleaning by the U.S. wheat industry, or if foreign buyers simply switch to the purchase of higher numbered grades.

Quality Preservation

The development of new, rapid quality measurement technology would facilitate any new efforts to identify and segregate wheat with specific intrinsic quality characteristics in the marketing process. A market segmentation program aimed at promoting wheat varieties that contain desirable intrinsic characteristics in quality-sensitive markets is an option discussed in the OTA report. However, segregating wheat by variety is not always effective in ensuring that foreign buyers receive

¹⁷Some elevators quit cleaning wheat after this change in dockage rounding procedure because under the new rounding procedure, dockage content in wheat would be recorded as 0.4 percent, for example, for a cleaning to that level, while under the old system the dockage would have been recorded as zero.

the intrinsic characteristics they want due to effects of different environments and locations of wheat production. As a result, segregating wheat by its intrinsic characteristics would be ideal if technologies to measure these characteristics are available.

The United States produces a wide range of varieties and classes of wheat. This, in itself, is a strength of the U.S. wheat industry, but it also is a problem because it compounds the lack of quality uniformity after handlers commingle different varieties of wheat in the export marketing process. Imposing some restrictions on the proliferation of wheat varieties available to U.S. wheat farmers is an option listed in the OTA study, but has practical difficulties. First, varietal restrictions tend to lower producers' net farm income because of yield loss. Varietal licensing standards in Canada were reported to result in a decline of 5 to 17 percent of current net farm income (Carter, Lyons, and Ahmadi-Esfahani). Second, controlling varieties does not necessarily yield desired intrinsic characteristics because intrinsic characteristics are influenced not only by variety, but also by location and growing conditions. Environmental diversity and widespread areas of wheat production ensure diverse wheat quality. Third, it would be difficult to enforce such restrictions in a system as wide-open as the United States. Thus, it is impossible to implement variety control programs in the United States.

An alternative to restricting wheat varieties is to measure and segregate important intrinsic qualities identified for quality-conscious markets in handling and marketing wheat according to variety identification or groups of varieties. Currently, there are methods to identify varieties in the market system, and they are used to some extent in other exporting countries. Quality preservation, however, can be best approached by segregating wheat according to its intrinsic characteristics, rather than a simple variety identification. There is a need to support the development of new, rapid quality measurement technology for segregating intrinsic quality characteristics associated with a particular variety, or well defined groups of varieties or subclasses, and technology to estimate baking characteristics of certain varieties.

Until the key intrinsic characteristics are measurable, a market segregation program could also be implemented to promote plant breeding of new varieties that contain intrinsic characteristics desired by foreign buyers, including protein quality and quantity, and low sprout damage. Since many foreign buyers place paramount emphasis on intrinsic characteristics over cleanliness, it is important that a market segregation program recognize foreign buyers' needs for these intrinsic characteristics. Variety identification and preservation, however, is a

crude substitute for objective tests to measure and preserve special intrinsic quality characteristics. Perhaps these measures can serve as interim solutions until practical objective tests become available.

Information Program To Meet Buyer Preferences

There have been concerns about whether foreign buyers' quality preferences with regard to cleanliness and intrinsic characteristics in wheat are effectively conveyed through the U.S. grain production-marketing system. Several factors have contributed to these concerns. First, U.S. farm commodity programs historically have paid more attention to quantity than to quality. Second, implementation of the EEP obscures the significance of wheat cleanliness and quality. These factors may have contributed to a distortion in the marketplace regarding the value of wheat cleanliness.

An active information program is needed to address difficulties encountered by foreign buyers in obtaining end-use characteristics of U.S. wheat. Such a program could entail varietal information about U.S. wheat and quality. The 1990 farm legislation requires that grain submitted for public testing must be evaluated for specific agronomic performance and end-use characteristics as determined by USDA. The results are to be disseminated by the Agricultural Research Service (ARS). The National Agricultural Statistics Service (NASS) is also required to periodically publish a survey of grain varieties produced in the United States. ARS is required to analyze the varietal survey data with regard to intrinsic quality information on varieties. This information is to be disseminated to breeders, producers, and end-users.

Implementing a market information program that conveys end-users' essential quality characteristics may pay dividends by enhancing U.S. competitiveness in the international market. Quality-related information conveyed from buyers to breeders, producers, and domestic handlers has played a role in changing the quality of U.S. wheat in the past. Examples include: (1) an expansion of hard white wheat acreage and varieties is in progress as a result of foreign buyers' interest in that class of wheat; (2) measuring and separate binning for low and high white wheat protein is happening because of problems in meeting the low-protein white wheat needs in some Asian markets; (3) breeding programs were initiated in the mid-1980's to develop desired color and gluten strength in durum for some buyers; (4) breeding programs were initiated in the late-1980's to address concerns over small kernels in HRW; and (5) categorizing wheat varieties and identifying end-use characteristics of varieties were initiated at the Kansas State University.

An important goal of a market information (outreach) program is to convey the desire for clean wheat in the cleanliness-conscious markets and the premium buyers in these markets are willing to pay for cleaner wheat. This information program could include information on any potential trade effects from selling cleaner U.S. wheat. This program could also clearly point out how net benefits could be obtained from investment that would lead to supplying the wheat quality desired by foreign buyers. In addition, this program could point out that while measures to deal with noncleanliness concerns are more technically difficult, dockage is an issue that already has technical solutions. Through this information program, plant breeders, producers, and domestic handlers would have access to more complete information for making a decision on whether to take the risk of developing or supplying the desired quality wheat.

Another important aspect of this information program is to convey that foreign buyers are aware of and strongly consider intrinsic characteristics, although it often is secondary to price in their import decisionmaking. Establishing new procedures or strengthening the existing system to resolve issues raised in implementing contracts between U.S. exporters and foreign buyers, such as periodic after-sales surveys of foreign buyers to identify their quality concerns or suggestions, would facilitate this pursuit.

Finally, an information program could be extended to familiarize foreign buyers about U.S. wheat quality and ways to change contract specification in order to receive cleaner wheat, as discussed earlier. Such a program can make information about U.S. wheat varieties and their quality characteristics available to foreign buyers.

To the extent possible, U.S. grain trade associations may find it within their purview to familiarize foreign buyers with U.S. wheat and quality of varieties, with funding from USDA. Also, USDA's Extension Service can incorporate and convey information about foreign buyers' quality preferences to domestic producers, plant breeders, handlers, and exporters (through its extension program).

Conclusions

Cleaning all U.S. wheat for export above and beyond the current level is not economically feasible because costs of cleaning at the lowest net-cost location--country elevators for spring wheat and subterminal elevators for winter wheat--would outweigh benefits by at least \$8 million per year in the short run.

The best strategy for promoting the cleanliness of U.S. export wheat is to target clean wheat for niche markets. Even though it is not in the U.S. wheat industry's interest to clean all export wheat, the industry could potentially gain \$8 to \$10 million in net benefits if it targets wheat cleaning to the cleanliness-conscious markets, which account for about 20 percent of all U.S. wheat exports. Classes of wheat to be targeted for cleaning primarily are dark northern spring (DNS) and durum wheats exported through the Pacific and Gulf ports.

The selection of a supply source in the world wheat market is influenced by price considerations (including credit programs and subsidies), cleanliness, quality considerations, and institutional factors. Wheat price, instead of quality, is the most important factor in foreign buyers' purchase decision in many lower income countries. Interviews with foreign buyers reveal that cleanliness, though an important factor, is generally not the paramount quality consideration. Enhancing U.S. quality competitiveness in the world market is as much an issue to address institutional barriers facing the United States vis-a-vis competitors as it is an issue to meet foreign buyers' quality needs. The institutional structure of the purchasing organization, the U.S. competitive selling system versus single-desk selling agencies of Canada and Australia, and difficulties encountered by relying on contract specification as a tool to meet foreign buyers' needs are important institutional factors affecting importers' purchase decisions. U.S. quality competitiveness can be enhanced by offering foreign buyers in the cleanliness-conscious markets a "clean wheat" contract specification, by continuing programs to improve quality determination, and by incorporating quality as a criterion in determining EEP bonuses.

Cleanliness and quality in general may play a more prominent role in foreign buyers' purchase decisions in the future. Relaxing state controls over grain trading in several countries that are currently contemplating such an action, including China, Russia, Taiwan, Ghana, Morocco, and Tunisia, could increase the impact of selectively offering cleaner wheat. Quality, especially intrinsic characteristics, could become more of a determining factor in the wheat trade as well if per capita income continues to grow in low-to-medium income importing countries and in quality-conscious markets. A GATT agreement reducing the use of export subsidies could also potentially reduce the interference of pricing segmentation by export subsidies and raise the importance of quality as a purchasing decision factor for importers. Also, cleanliness and quality will become more important as a result of growing concerns about food safety and more specific contracts which reflect

increasing sophistication in milling and baking technology.

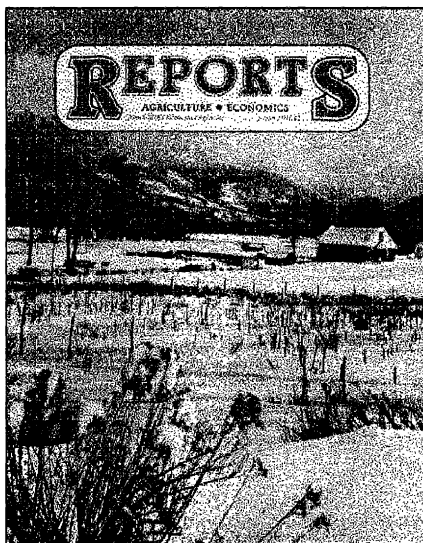
Any public policy designed to promote the cleanliness of U.S. wheat exports and to improve U.S. competitiveness on the world market must address the issue of how much, where, and which classes of wheat to clean and target for cleanliness-conscious markets. Policy options worth considering include establishing dockage as a grade-determining factor and launching an information (outreach) program to help producers meet buyer preferences and to familiarize foreign buyers with U.S. wheat quality. In the short run, this information program could prove to be most effective. This information program, together with a quality preservation program to segregate U.S. wheat by intrinsic characteristics, can also be implemented to enhance overall U.S. quality competitiveness in the world market. All policy options must be critically evaluated in terms of their costs and benefits before receiving serious consideration.

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SUMMARY OF REPORT #AIB-683

Characteristics, Production Costs Compared For U.S. Wheat Producers

October 1993

Contact: Dargan Glaze, (202) 219-0801.

Producing a bushel of wheat cost U.S. farmers an average of \$2.07 in variable cash expenses in 1989. Individual farm costs ranged from less than \$1.37 to more than \$3.49 per bushel. Wheat acreage, yields, and regional differences among producers influenced wheat production costs. These findings are drawn from a recently published report by USDA's Economic Research Service, *Characteristics and Production Costs of U.S. Wheat Farms, 1989*.

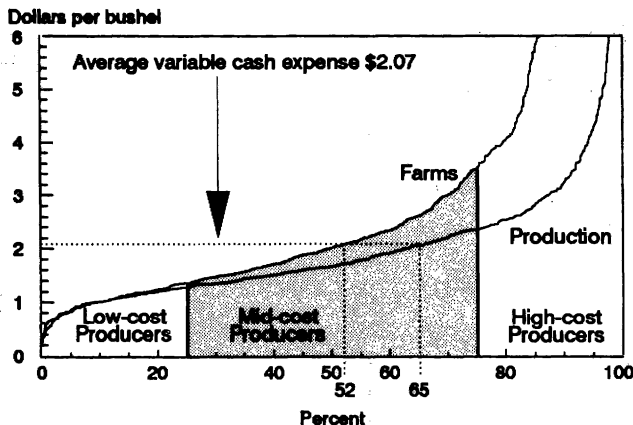
Differences in regional production practices and adverse weather conditions were major influences on production costs and yields. Dry weather and warm temperatures reduced already low subsoil moisture levels throughout the Plains in 1989, resulting in lower wheat yields. Low snowfall and low temperatures caused freeze damage in some parts of the Central and Southern Plains region (CO, KS, NE, OK, and TX), resulting in that region's accounting for 64 percent of all farms in the high-cost group. Since high-cost wheat farms were more diversified than low-cost farms, wheat

contributed less to their total farm income. Low-cost producers were concentrated in the North-Central (IL, IN, MO, NY, OH, and PA) and Northern Plains regions (ND, SD, MN, MT, and WY). Other wheat production regions included the Southeast (AL, AR, GA, LA, MS, NC, SC, and VA) and the Pacific (AZ, CA, ID, NM, OR, and WA).

Although there was close to a 7-percent decline in winter wheat production in 1989, the decline was more than offset by increased production of spring and durum wheat, increasing total wheat production by nearly 12 percent for the year. About a fourth of the winter wheat acreage planted was not harvested in 1989, compared with less than 19 percent for all wheat classes. Data for this study are from the 1989 Farm Costs and Returns Survey (FCRS) of U.S. wheat farms. Responses represented 189,877 farms producing 1.27 billion bushels of wheat on about 51.8 million acres (62 percent of U.S. wheat production and 68 percent of planted acreage).

Cumulative distribution of wheat variable cash expenses, 1989

About 52 percent of FCRS wheat farms had variable cash expenses at or below the average cost of \$2.07 per bushel, while 65 percent of the total wheat harvest was produced at or below the average variable cash expense.



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